



Qiagen 4<sup>th</sup> Investigator Forum (Düsseldorf, Germany)  
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# International Standards in Forensic DNA and Recent Forensic Science Activities in the United States

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# Location of NIST



North America Headquarters for Qiagen is ~10 km from NIST in Germantown, Maryland

**NIST**  
Gaithersburg,  
Maryland

I-270

Capitol Beltway  
(I-495)

I-95

Baltimore, MD

BWI  
Airport



Washington  
D.C.

Reagan National  
Airport

Dulles  
Airport

I-66

I-95

**FBI  
Lab**  
~100 km  
from NIST

Richmond, VA



<http://www.factoryoutletstores.info/img/usa-map.gif>

# Presentation Outline

- International Standards in Forensic DNA
  - Benefits of standards
    - Help improve quality and consistency in testing
  - Authority to establish standards
    - Expert groups like SWGDAM, ISFG DNA Commission, ENFSI DNA WG, AFSN, OSAC
  - Documentary and physical standards
    - Quality Assurance Standards (QAS)
    - Core loci and common data formats
    - Certified Reference Materials (e.g., NIST SRM)
- Recent U.S. Activities in Forensic Science
  - National Commission on Forensic Science (NCFS)
  - Organization of Scientific Area Committees (OSAC)

**Why?**

**Who?**

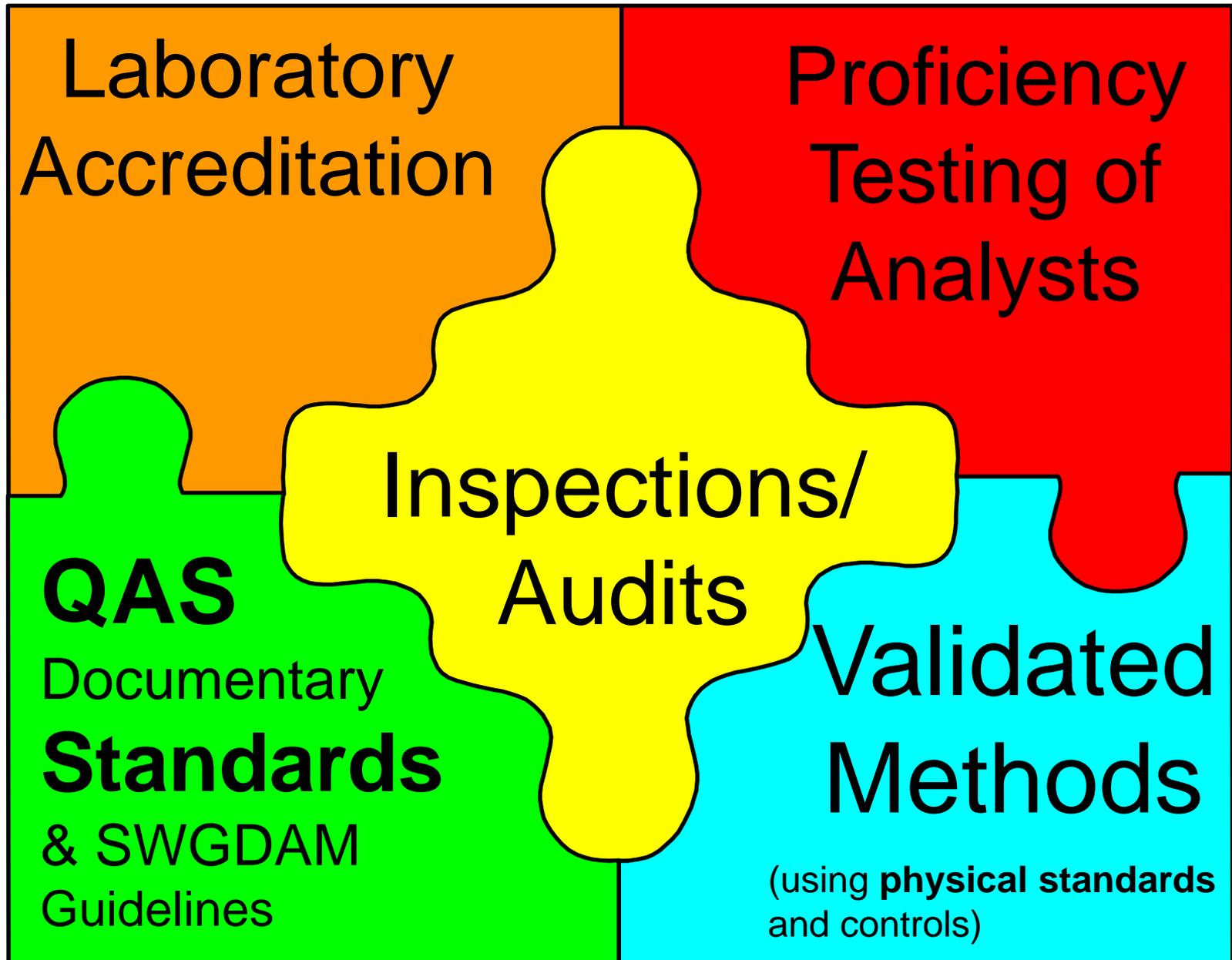
**What?**

**How?**

# Standards Aid Consistency and Quality

- Consistent processes
  - Documentary standards
- Reliable data comparison
  - Standard data formats and core DNA testing regions
- **I believe that the use of standard methods and materials are a primary reason that DNA is on a more solid foundation compared to many of the other forensic disciplines**

# Ensuring Accurate Forensic DNA Results



# Types of Standards

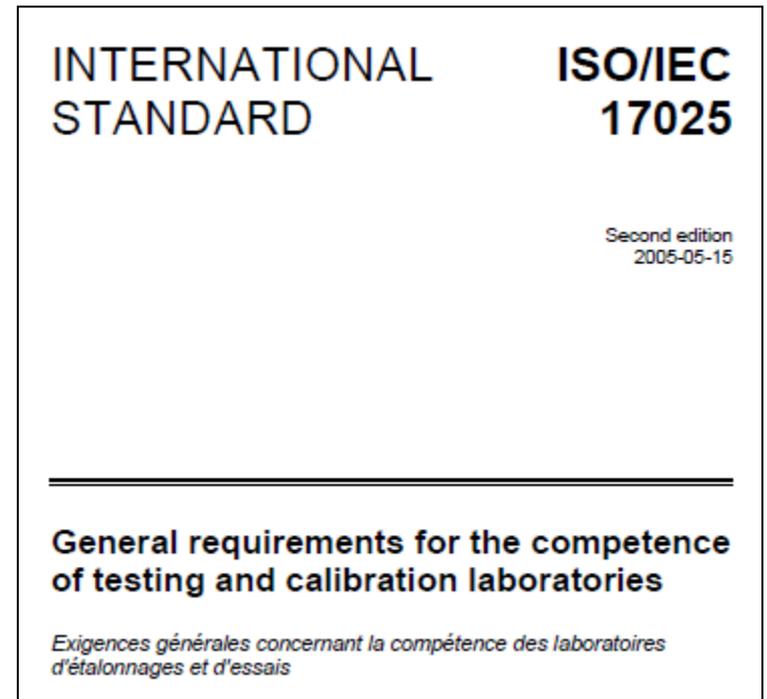
## physical (measurement) standards



Certified reference material to aid with calibration of measurements

<http://www.nist.gov/srm/>

## documentary (technical) standards



Specific requirements for the operation of a laboratory related to management system and competence

# DNA SRM 2391c Certificate Updated

3 April 2015



National Institute of Standards & Technology

## Certificate of Analysis

Standard Reference Material® 2391c

PCR-Based DNA Profiling Standard

*What's New?* Addition of Sanger sequencing analysis; additional STR genotyping test kits used towards certification; extension of certification date; editorial changes

### Certified Genotypes/Haplotypes

25 autosomal STR loci and amelogenin  
29 Y-STR loci

### 6 Components

- A (single-source female genomic DNA)
- B (single-source male genomic DNA)
- C (single-source male genomic DNA)
- D (3:1 mixture of A and C)
- E (female cells on 903 paper)
- F (male cells on FTA paper)

### Reference Genotypes

26 autosomal STRs

### Information Genotypes/Haplotypes

1 autosomal STR: Penta C  
12 X-STR loci  
30 InDels (DIplex)

### STR Kit Coverage

*Thermo Fisher Applied Biosystems (Foster City, CA):* AmpFISTR Identifiler, Identifiler Plus, NGM, NGM SElect, Cofiler, Profiler, Profiler Plus, Profiler Plus ID, SGM Plus, SEfiler, MiniFiler, GlobalFiler, YFiler, YFiler Plus

*Promega Corporation (Madison, WI):* PowerPlex 16, 16 HS, ESX 17, ESI 17, ES, S5, ESI 17 Pro, ESI 17 Fast, ESX 17 Fast, 18D, 21, CS7, Fusion, Y, Y23

*Qiagen (Hilden, Germany):* Investigator ESSplex, IDplex, ESSplex SE, ESSplex SE Plus, ESSplex SE GO!, IDplex Plus, IDplex GO!, 24plex, 24plex GO!, Argus X-12, DIplex

# Allele Sequences Provided in New SRM 2391c Certificate to Aid Use with Next-Generation Sequencing

Table 14. Autosomal STR Sequencing for Component E

SRM 2391c – Component E				
Marker	Length-based Types	Sanger Result	Repeat Structure –Allele 1	Repeat Structure –Allele 2
D1S1656	11, 16.3	11, 16.3	[TAGA] <sub>11</sub> [TG] <sub>5</sub>	[TAGA] <sub>4</sub> TGA [TAGA] <sub>11</sub> TAGG [TG] <sub>5</sub>
D2S1338	19, 20	19, 20	[TGCC] <sub>7</sub> [TTCC] <sub>12</sub>	[TGCC] <sub>7</sub> [TTCC] <sub>13</sub>
D2S441	10, 10	10, 10	[TCTA] <sub>10</sub>	[TCTA] <sub>8</sub> TCTG [TCTA] <sub>1</sub>
D3S1358	14, 15	14, 15	TCTA [TCTG] <sub>2</sub> [TCTA] <sub>11</sub>	TCTA [TCTG] <sub>2</sub> [TCTA] <sub>12</sub>
D5S818	11, 13	11, 13	[AGAT] <sub>11</sub>	[AGAT] <sub>13</sub>
D6S1043	11, 11	11, 11	[AGAT] <sub>11</sub>	[AGAT] <sub>11</sub>
D7S820	8, 10	8, 10	[GATA] <sub>8</sub>	[GATA] <sub>10</sub>
D8S1179	11, 13	11, 13	[TCTA] <sub>11</sub>	[TCTA] TCTG [TCTA] <sub>11</sub>
D8S1115	9, 16	9, 16	[ATT] <sub>9</sub>	[ATT] <sub>16</sub>
D10S1248	14, 14	14, 14	[GGAA] <sub>14</sub>	[GGAA] <sub>14</sub>
D12S391	17, 22	17, 22	[AGAT] <sub>10</sub> [AGAC] <sub>6</sub> AGAT	[AGAT] <sub>13</sub> [AGAC] <sub>8</sub> AGAT
D13S317	8, 12	8, 12	[TATC] <sub>8</sub>	[TATC] <sub>12</sub> , A→T SNP 1 bp ds from repeat
D16S539	11, 12	11, 12	[GATA] <sub>11</sub>	[GATA] <sub>12</sub>
D18S51	14, 17	14, 17	[AGAA] <sub>14</sub>	[AGAA] <sub>17</sub>
D19S433	14, 14	14, 14	[AAGG] AAAG [AAGG] TAGG [AAGG] <sub>12</sub>	[AAGG] AAAG [AAGG] TAGG [AAGG] <sub>12</sub>
D21S11	29, 30	29, 30	[TCTA] <sub>4</sub> [TCTG] <sub>6</sub> {[TCTA] <sub>3</sub> TA [TCTA] <sub>3</sub> TCA [TCTA] <sub>2</sub> TCCATA} [TCTA] <sub>11</sub>	[TCTA] <sub>2</sub> TATA [TCTA] <sub>3</sub> [TCTG] <sub>5</sub> {[TCTA] <sub>3</sub> TA [TCTA] <sub>3</sub> TCA [TCTA] <sub>2</sub> TCCATA} [TCTA] <sub>11</sub>

# International and Regional Coordination Efforts in Forensic Science



2004



1974



2004



2008



1995



1968



2008



2008



1986

# Organizations Assisting Forensic Science Quality Assurance

Organization; year started	Membership	Website
American Society of Crime Laboratory Directors ( <b>ASCLD</b> ); started in 1974	U.S. federal, state, and local lab managers; not directly associated with SWGDAM but ASCLD/LAB (not ASCLD) uses the FBI Quality Assurance Standards for DNA audits	<a href="http://www.asclcd.org">http://www.asclcd.org</a>
European Network of Forensic Science Institutes ( <b>ENFSI</b> ); started in 1995	16 working groups including one on DNA	<a href="http://www.enfsi.eu">http://www.enfsi.eu</a>
UK Forensic Science Regulator; started in 2008	Multiple advisory groups inform the Regulator including one on DNA	<a href="https://www.gov.uk/government/organisations/forensic-science-regulator">https://www.gov.uk/government/organisations/forensic-science-regulator</a>
Senior Managers of Australian and New Zealand Forensic Laboratories ( <b>SMANZFL</b> ); started in 1986	8 Specialist Advisory Groups (SAG) including one on biology (BSAG)	<a href="http://www.nifs.com.au/SMANZFL/SMANZFL.html">http://www.nifs.com.au/SMANZFL/SMANZFL.html</a>
Academia Iberoamericana de Criminalística y Estudios Forenses ( <b>AICEF</b> ); started in 2004	Represents 19 Spanish and Portuguese speaking countries in Europe and Latin America; has four working groups including one on forensic genetics	<a href="http://www.aicef.net/">http://www.aicef.net/</a>
Asian Forensic Sciences Network ( <b>AFSN</b> ); started in 2008	5 working groups including one on DNA	<a href="http://www.asianforensic.net">http://www.asianforensic.net</a>

Butler, J.M. (2013) Forensic DNA advisory groups: DAB, SWGDAM, ENFSI, and BSAG. Chapter in Siegel, J.A. & Saukko, P.J. (editors) *Encyclopedia of Forensic Sciences, Second Edition*. Elsevier Academic Press: San Diego. pp. 339-343.



# International Forensic Strategic Alliance (IFSA) initiated in Nov 2004

- <http://www.enfsi.eu/ifsa>
- **Crafting minimum requirements documents** to aid developing countries with forensic science
- Released in Oct 2014:  
**“Minimum Requirements for DNA Collection, Analysis, and Interpretation”**

*multilateral partnership between the regional networks of operational forensic laboratories*



US & Canada

Europe

Australia,  
New Zealand

Latin America,  
South America,  
Spain & Portugal

Asia

South Africa

# Forensic DNA Advisory Groups

- ISFG DNA Commission (International)
- FBI DNA Advisory Board (U.S.)
- SWGDAM (U.S.)
- ENFSI DNA WG (Europe)
- Forensic Science Regulator (UK)
- Biology Specialist Advisory Group (Australia/NZ)
- Asian Forensic Science Network DNA WG (Asia)
- **NCFS and OSAC (U.S.)**



# Forensic DNA Advisory Groups

Organization	Membership	Meeting Frequency/Purpose
DNA Commission of the International Society for Forensic Genetics ( <b>ISFG</b> )	ISFG Executive Committee and selected experts; chaired by Dr. Peter Gill	As needed to prepare recommendations (see <a href="http://www.isfg.org/Publications/DNA+Commission">http://www.isfg.org/Publications/DNA+Commission</a> )
Scientific Working Group on DNA Analysis Methods ( <b>SWGDM</b> )	U.S. and Canada federal, state, and local DNA Technical Leaders and invited guests (40-50 people total); subdivided into 5-8 committees	Meets twice a year to develop guidelines on validation, DNA data interpretation, and other topics
European Network of Forensic Science Institutes ( <b>ENFSI</b> ) DNA Working Group	>30 European countries and invited guests (90-100 people total); subdivided into 5 committees	Meets twice a year along with European DNA Profiling Group (EDNAP)
Biology Specialist Advisory Group ( <b>BSAG</b> )	Representatives of each forensic DNA lab in Australia & New Zealand (11 people total)	Meets once a year under direction of SMANZFL and with support of the Australian National Institute of Forensic Science
<b>Organization of Scientific Area Committees (OSAC)</b>	24 discipline-specific subcommittees (has two DNA groups focused on methods and interpretation)	<b>Just starting in 2014</b> ; plans to meet once a year in person and multiple times virtually

Butler, J.M. (2013) Forensic DNA advisory groups: DAB, SWGDAM, ENFSI, and BSAG. Chapter in Siegel, J.A. & Saukko, P.J. (editors) *Encyclopedia of Forensic Sciences, Second Edition*. Elsevier Academic Press: San Diego. pp. 339-343.

and recent events at NIST – see <http://www.nist.gov/forensics/osac/index.cfm>



# International Society for Forensic Genetics (ISFG) DNA Commission Recommendations

Topics Addressed	Publications (16 as of 2014)
DNA polymorphisms	FSI 1989 (43:109-111) FSI 1992 (52:125-130) FSI 1992 (55:1-3)
Commentary on the 1992 NRC I report	FSI 1993 (59:1-2)
STR markers and allele nomenclature	IJLM 1994 (107:159-160) IJLM 1997 (110:175-176)
Mitochondrial DNA typing Revised and extended guidelines	FSI 2000 (110:79-85) FSIG 2014 (13:134-142)
Y-chromosome STRs Additional recommendations on nomenclature	FSI 2001 (124:5-10) FSI 2006 (157:187-197)
Interpretation of DNA mixtures STR typing results using probabilistic methods	FSI 2006 (160:90-101) FSIG 2012 (6:679-688)
Non-human (animal) DNA	FSIG 2011 (5:501-505)
Disaster victim identification	FSIG 2007 (1:3-12)
Paternity Testing Commission Biostatistics in paternity testing	FSI 2002 (129:148-157) FSIG 2007 (1:223-231)

FSI: *Forensic Science International*; IJLM: *International Journal of Legal Medicine*; FSIG: *Forensic Science International: Genetics*



# European Network of Forensic Science Institutes (ENFSI) DNA Working Group Documents Available

**One of now 17 working groups in ENFSI; meets at least once each year typically in April; representatives from 35 countries**

<http://www.enfsi.eu/about-enfsi/structure/working-groups/dna>

Year	Document
May 2004	<a href="#">Terms and Abbreviations</a>
2009	<a href="#">Report on DNA Legislation in Europe</a>
April 2006	<a href="#">Report on Criminal Cases in Europe Solved by DNA Mass Testing</a>
Nov 2010	<a href="#">Recommended Minimum Criteria for the Validation of Various Aspects of the DNA Profiling Process</a>
Nov 2010	<a href="#">Training DNA staff</a>
Nov 2010	<a href="#">Contamination Prevention Guidelines</a>
Dec 2013	<a href="#">Survey of DNA Databases in Europe</a>
April 2014	<a href="#">DNA Database Management: Review and Recommendations</a>

## Selects core DNA testing markers for Europe

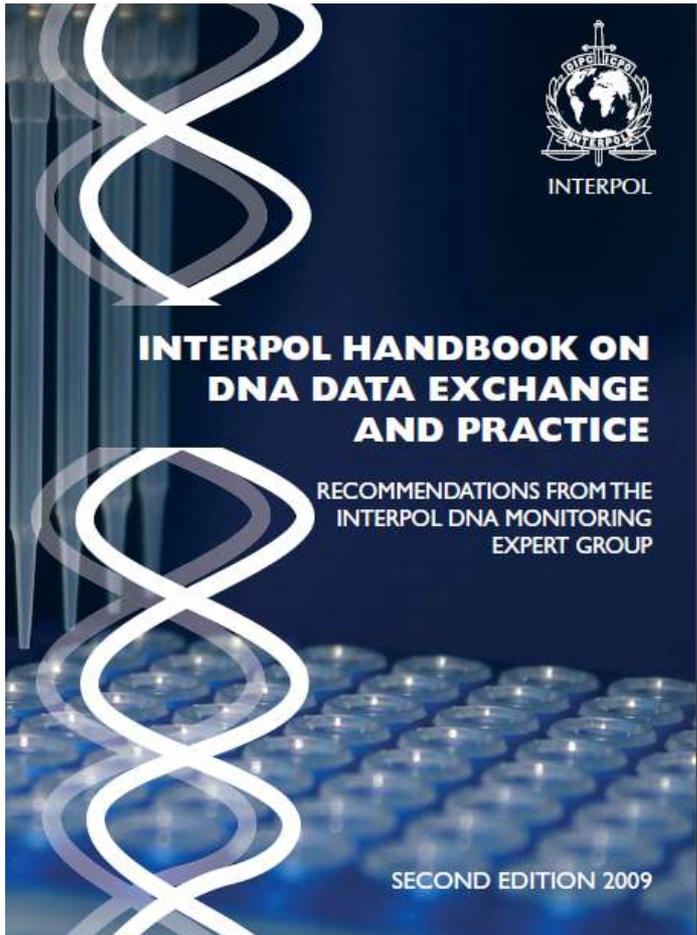
Gill, P., et al. (2006a). The evolution of DNA databases-Recommendations for new European STR loci. *Forensic Science International*, 156, 242-244.

Gill, P., et al. (2006b). New multiplexes for Europe-amendments and clarification of strategic development. *Forensic Science International*, 163, 155-157.



# ENFSI DNA Database Management: Review and Recommendations

- Since first version in 2008, this document is **revised each April** by Kees van der Beek from the Netherlands Forensic Institute
- Current document is 88 pages long with **33 recommendations** (and questions for audit purposes)
- Useful and up-to-date information provided on European DNA database activities



118 pages (pdf document)

# Interpol Handbook

- Interpol Standard Set of Loci (ISSOL) are the same as the European Standard Set (ESS)
- in 2010, ISSOL was expanded from 7 to 12 loci
- Supports ENFSI DNA Database Management recommendations

<https://www.gov.uk/government/organisations/forensic-science-regulator>

Several documents have been published recently

- **Codes of Practice and Conduct** for forensic science providers and practitioners in the Criminal Justice System (Aug 2014, 56 pages)
- FSR-C-108 **APPENDIX: DNA Analysis** (Sept 2014, 11 pages): DNA analysis: codes of practice and conduct
- FSR-G-213 **GUIDANCE** (Sept 2014, 15 pages): **Allele frequency databases and reporting** guidance for the DNA (Short Tandem Repeat) profiling; contains 8 recommendations
- FSR-P-302 **PROTOCOL** (Sept 2014, 49 pages): **DNA contamination detection** -The management and use of staff elimination DNA databases

# DNA Contamination Concerns

- *Forensic Sci. Int. Genet.* (July 2010) statement by ENFSI, SWGDAM, and BSAG
- Written to commercial manufacturers of disposable plastic-ware and other reagents used by forensic DNA laboratories worldwide
- Advocates that manufacturers: (1) utilize automation in manufacturing lines, (2) minimize interaction of staff with manufacturing lines, (3) ensure products are protected from staff using personal protective equipment, (4) utilize clean rooms for production, (5) perform QC checks with adequate sensitivity, (6) conduct post-manufacture DNA contaminant destruction, (7) perform QC checks on post-production treatment(s), and (8) maintain staff elimination databases for screening DNA results as needed

# ISO/IEC 18385 Standard

- “Minimizing the risk of DNA contamination in products used to collect and analyze biological material for forensic purposes”
- **Under development** and review by participating ISO member countries



DRAFT INTERNATIONAL STANDARD  
ISO/DIS 18385.2

ISO/PC 272                      Secretariat: SA  
Voting begins on:                Voting terminates on:  
2014-12-05                      2015-03-05

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**Minimizing the risk of human DNA contamination in products used to collect, store and analyze biological material for forensic purposes**

*Réduire au maximum le risque de contamination de l'ADN dans les produits utilisés pour recueillir et analyser du matériel biologique en criminalistique*

ICS: 11.100.99

# FBI Quality Assurance Standards (QAS)

- **DNA Identification Act of 1994**
  - Requires FBI Laboratory, those labs receiving federal funds, and those labs using the National DNA Index System (NDIS) to comply
- FBI Laboratory's DNA Advisory Board (**DAB**)
  - Met from 1995 to 2000 to discuss and draft QAS
  - FBI Director issued initial QAS in October 1998 (caseworking) and April 1999 (databasing)
- Scientific Working Group on DNA Analysis Methods (**SWGDM**)
  - assumed responsibility for QAS revisions when DAB was dissolved
  - QAS revisions released in July 2009 and September 2011
- **QAS audit documents are used by accrediting bodies** such as ASCLD/LAB in audits of DNA laboratories as **supplemental material to the ISO/IEC 17025 standard**



# The FBI Quality Assurance Standards

**Began in 1998/99 with updates via SWGDAM in 2009, 2011, 2014, ...**

## QUALITY ASSURANCE STANDARDS FOR DNA DATABASING LABORATORIES

### QUALITY ASSURANCE STANDARDS FOR FORENSIC DNA TESTING LABORATORIES

This document consists of definitions and standards. The standards are quality assurance measures that place specific requirements on the laboratory. Equivalent measures not outlined in this document may also meet the standard if determined sufficient through an accreditation process.

#### EFFECTIVE DATE:

These standards shall take effect September 1, 2011.

REFERENCES: Federal Bureau of Investigation, "Quality Assurance Standards for Forensic DNA Testing Laboratories" and "Quality Assurance Standards for Convicted Offender DNA Databasing Laboratories," Forensic Science Communications, July 2000, Volume 2, Number 3.

## THE FBI QUALITY ASSURANCE STANDARDS

### THE FBI QUALITY ASSURANCE STANDARDS

#### AUDIT FOR

### FORENSIC DNA TESTING LABORATORIES

IN ACCORDANCE WITH

THE QUALITY ASSURANCE STANDARDS

FOR

FORENSIC DNA TESTING LABORATORIES

EFFECTIVE SEPTEMBER 1, 2011

1. SCOPE
2. DEFINITIONS
3. QUALITY ASSURANCE PROGRAM
4. ORGANIZATION AND MANAGEMENT
5. PERSONNEL
6. FACILITIES
7. EVIDENCE (*SAMPLE*) CONTROL
8. VALIDATION
9. ANALYTICAL PROCEDURES
10. EQUIPMENT CALIBRATION AND MAINTENANCE
11. REPORTS
12. REVIEW
13. PROFICIENCY TESTING
14. CORRECTIVE ACTION
15. AUDITS
16. SAFETY
17. OUTSOURCING

<http://www.fbi.gov/about-us/lab/biometric-analysis/codis/qas-standards-for-forensic-dna-testing-laboratories-effective-9-1-2011>

<http://www.fbi.gov/about-us/lab/biometric-analysis/codis/qas-standards-for-dna-databasing-laboratories-effective-9-1-2011>



# Scientific Working Group on DNA Analysis Methods (SWGDM)

<http://www.swgdam.org/>

- **Established in November 1988 by FBI Laboratory**
- Named Technical Working Group on DNA Analysis Methods (TWGDAM) for the first decade
- **Comprised of ~50 scientists from U.S. and Canada**
  - Typically 20-25 voting members and the rest as invited guests
- European Network of Forensic Science Institutes (ENFSI) DNA Working Group representative often attends
- **Three day meetings held semiannually every January and July**
- **Current committees (6) and working groups (2):**
  - Autosomal STR Interpretation, Combined DNA Index System, Enhanced Detection Methods and Interpretation, Quality Assurance, Rapid DNA, Y-STR, **Probabilistic Genotyping**, and **Next Generation Sequencing**
- Previous committees:
  - RFLP, PCR, mitochondrial DNA, mass spectrometry, training, validation, expert systems, missing persons/mass disasters, and mixture interpretation



# Current SWGDAM Guidelines

*Hyperlinks to documents available on SWGDAM.org*

Release Date	Guidelines	Previous Versions (TWGDAM)
2010	<a href="#">STR Interpretation Guidelines</a>	2000
2012	<a href="#">Validation Guidelines for Forensic DNA Analysis Methods</a>	1991, 1995, 2004
2013	<a href="#">Mitochondrial DNA Analysis Interpretation Guidelines</a> & <a href="#">Mitochondrial DNA Nomenclature Example</a>	1993, 2003
2013	<a href="#">Training Guidelines</a>	2001
2014	<a href="#">Guidelines for Missing Persons Casework</a>	--
2014	<a href="#">Interpretation Guidelines for Y-Chromosome STRs</a>	2009
2014	<a href="#">STR Enhanced Detection Methods</a>	--
2015	<a href="#">Collection and Serological Examination of Biological Evidence</a>	--

***Guidelines in development:*** validation of probabilistic genotyping software, and updated STR interpretation guidelines

# Public Comments Can Now Be Made on Draft SWGDAM Documents



## Public Comments Page

In accordance with the SWGDAM Bylaws (Section V.C.5), SWGDAM will make any new or revised guidance or standard document(s) available for public comment for a minimum of 30 days. Generally, SWGDAM attempts to review its guidance documents within 5 years of their issuance and is usually actively revising at least one of its guidance documents at any given time. SWGDAM strongly encourages the forensic DNA community or other interested group to comment on the SWGDAM documents currently in this stage of development.

Upon receipt, these comments will be forwarded to the appropriate SWGDAM Committee for consideration and may be incorporated into the final document considered for approval by the SWGDAM Membership. Alternately, SWGDAM may publish a response to a specific suggestion or recommendation on its FAQ Page for general information purposes. SWGDAM will make all reasonable efforts to advise the forensic DNA

community of those documents currently available for public comment. SWGDAM strongly encourages all interested parties to regularly monitor SWGDAM.org for the guidance document(s) or standard document(s) currently available for public comment. Please use the contact portal below for providing comments on the SWGDAM document(s) available for public comment.

## SWGDAM Documents Available for Public Comment

The following guidance or standards document(s) is/are currently available for public comment until April 18, 2015:

### [SWGDAM Guidelines for the Validation of Probabilistic Genotyping Systems](#)

Details: This document provides guidelines for the validation of probabilistic genotyping software used for the analysis of autosomal short tandem repeat (STR) typing results. Probabilistic genotyping refers to the use of biological modeling, statistical theory, computer algorithms, and probability distributions to infer genotypes and calculate likelihood ratios (LRs) for the DNA typing results of forensic samples. A probabilistic genotyping system is comprised of software, or software and hardware, with analytical and statistical functions that entail complex formulae and algorithms. Probabilistic genotyping approaches can reduce subjectivity in the analysis of DNA typing results, as compared to historical methods of mixture interpretation (e.g., deconvolution of the mixture into individual components), and quantifies uncertainty in the analysis.

[http://swgdam.org/public\\_review.html](http://swgdam.org/public_review.html)

# Current Hierarchy of Standards for Accrediting Bodies to Use in Auditing U.S. Forensic DNA Laboratories



International Laboratory Accreditation Cooperation (ILAC)  
**G19:08/2014 Modules in a Forensic Science Process**



**ISO/IEC 17025:2005 General requirements for the  
competence of testing and calibration laboratories**



**The FBI Quality Assurance Standards (2011)** serve as  
supplemental materials to ISO/IEC 17025 for DNA audits



**SWGDAM guidelines** (interpretation, validation, etc.)  
provide further information but are not audited against



# Standard Approaches Enable Reliable DNA Data Comparison

- **Core loci**
  - In 1997, U.S. selected 13 core STR markers
  - U.S. is moving to 20 core STRs in January 2017
  - Europe moved from 7 to 12 core STR loci in 2011
- **Common data formats**
  - ISFG DNA Commission allele nomenclature designation recommendations
  - ANSI/NIST-ITL standard for data storage and transmission
- **Commercial STR kits**
  - Consistent allelic ladders
- **Certified reference materials**
  - NIST SRM 2391c (certified values for STR allele measurements)

# U.S. is Moving to 20 Core Loci

Forensic Science International: Genetics 17 (2015) 33–34

Contents lists available at ScienceDirect

Forensic Science International: Genetics

journal homepage: [www.elsevier.com/locate/fsig](http://www.elsevier.com/locate/fsig)



Locus

CSF1PO

D3S1358

D5S818

D7S820

D8S1179

D13S317

D16S539

D18S51

D21S11

FGA

TH01

TPOX

vWA

D1S1656

D2S441

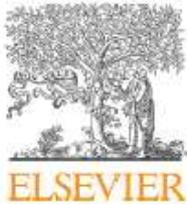
D2S1338

D10S1248

D12S391

D19S433

D22S1045



## Letter to the Editor

### Selection and implementation of expanded CODIS core loci in the United States

“The CODIS Core Loci Working Group selected a consortium of 11 CODIS laboratories...these laboratories performed validation experiments...”

**With the assistance of the National Institute of Standards and Technology (NIST),** the data generated through these validation studies were compiled, reviewed and analyzed.”

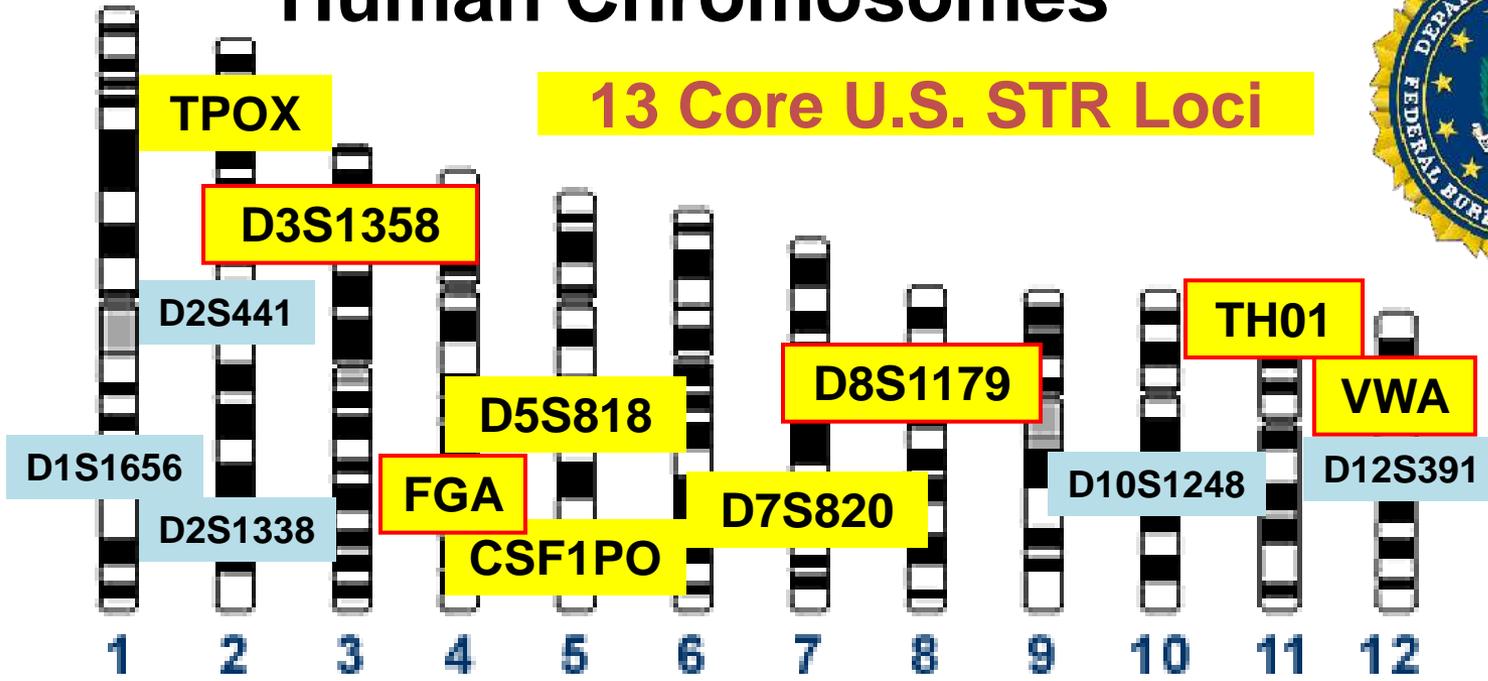
Red is for original CODIS Core 13 Loci.

Blue is for new additional CODIS Core Loci.

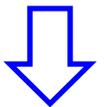
# Position of Forensic STR Markers on Human Chromosomes



Core STR Loci for the United States

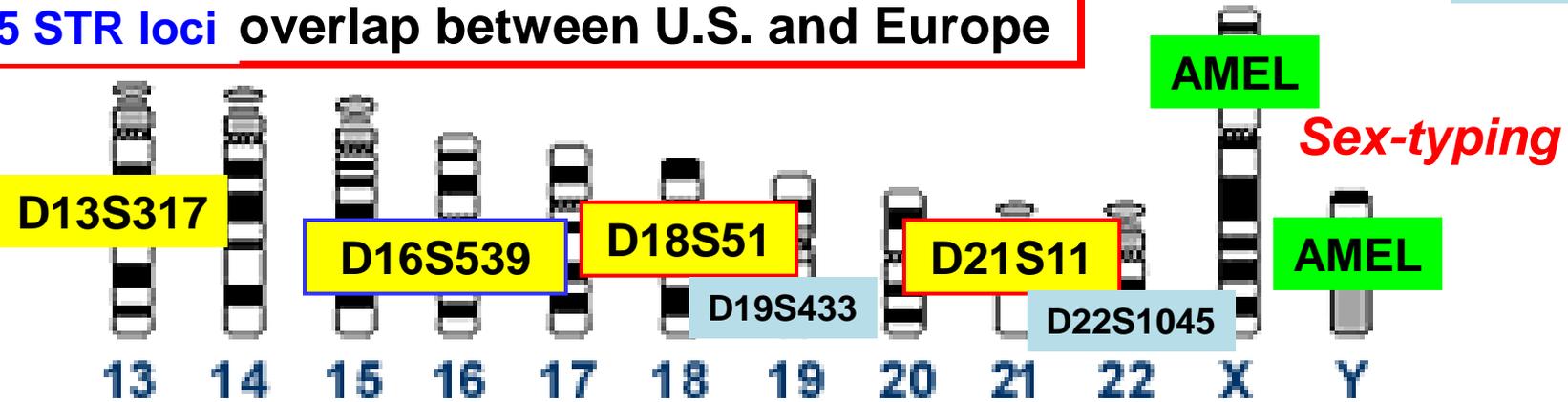


**1997**  
(13 loci)



**2017**  
(20 loci)

**15 STR loci overlap between U.S. and Europe**



# U.S. Core Loci Expansion Efforts

More loci added as databases grew...

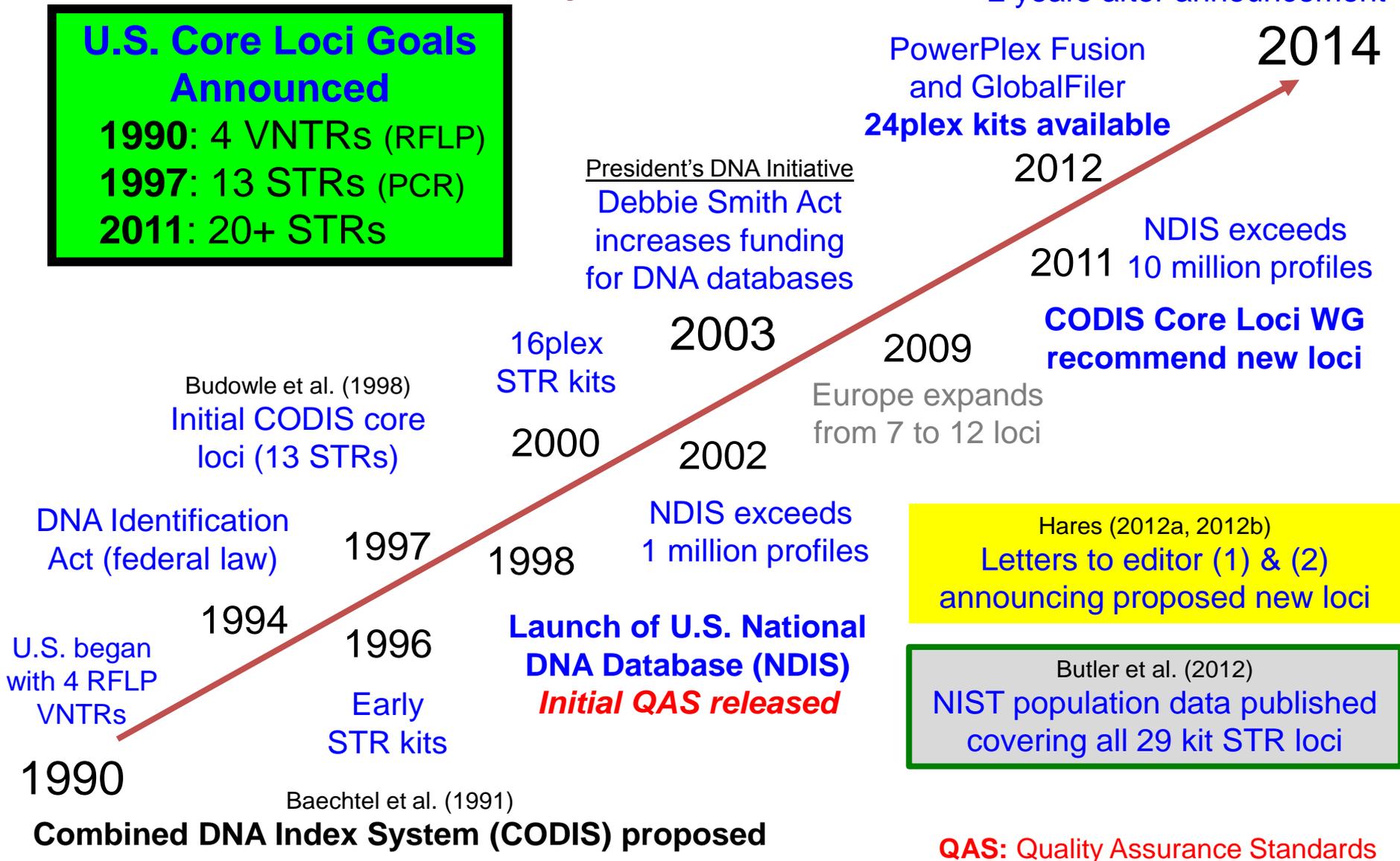
Implementation to be required  
2 years after announcement

## U.S. Core Loci Goals Announced

**1990:** 4 VNTRs (RFLP)

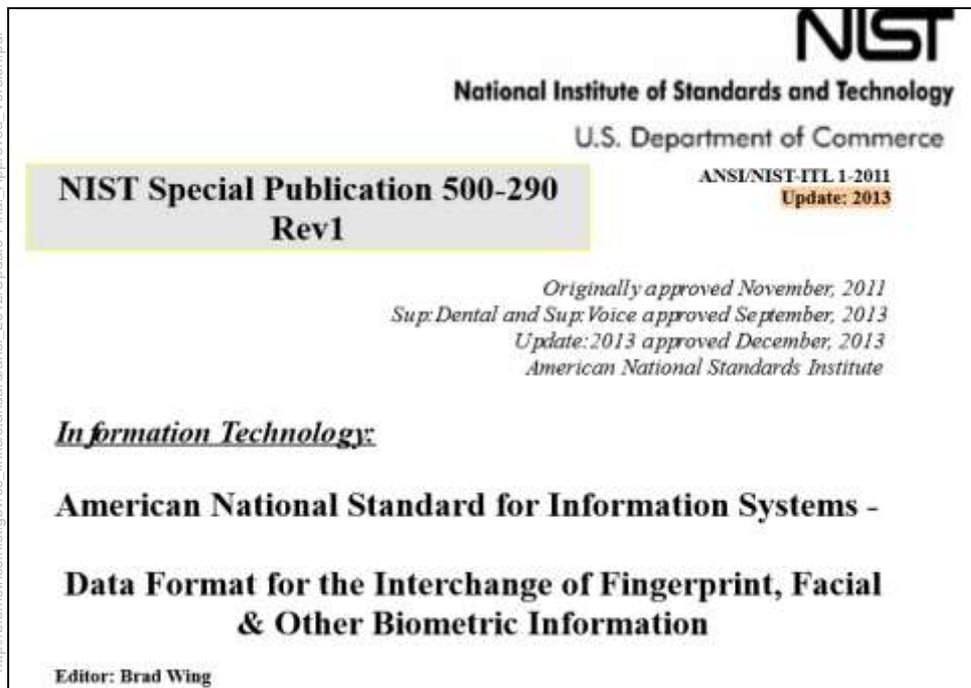
**1997:** 13 STRs (PCR)

**2011:** 20+ STRs



# ANSI/NIST-ITL Standard Data Format

[http://www.nist.gov/itl/iad/ig/ansi\\_standard.cfm](http://www.nist.gov/itl/iad/ig/ansi_standard.cfm)



**623 page document**

**Latest update: December 2013**

- **Data storage and transmission standard for software developers**
- Record types include biometric fingerprint, iris, dental, and voice information
- **DNA records (type 18) are covered in 24 pages**
- Provides list and codes for **88 DNA kits** from Life Technologies, Promega, and Qiagen
- Codes provided for **64 autosomal STR loci, 64 X-STRs, and 135 Y-STRs**

[http://biometrics.nist.gov/cs\\_links/standard/ansi\\_2012/Type\\_18\\_DNA\\_Record\\_Kits\\_List\\_111913.pdf](http://biometrics.nist.gov/cs_links/standard/ansi_2012/Type_18_DNA_Record_Kits_List_111913.pdf)

[http://biometrics.nist.gov/cs\\_links/standard/ansi\\_2012/Type\\_18\\_DNA\\_Record\\_Loci\\_list\\_111913.pdf](http://biometrics.nist.gov/cs_links/standard/ansi_2012/Type_18_DNA_Record_Loci_list_111913.pdf)

# Standard Information Resources

NIST STRBase website: <http://www.cstl.nist.gov/strbase/>



## Short Tandem Repeat DNA

### Internet DataBase



NIST [Standard Reference Database](#) SRD 130

[[Recent Updates](#)]

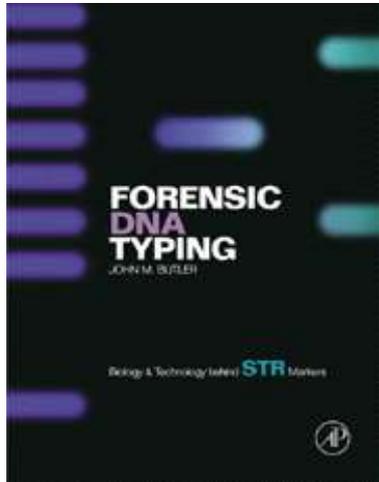
*Serving the forensic DNA and human identity testing communities for over 10 years...* These data are intended to benefit research and application of short tandem repeat DNA markers to human identity testing. The authors are solely responsible for the information herein. **Please Rate Our Products and Services:** <http://tsapps.nist.gov/MSDSurvey/default.aspx?ID=5&DB=130>

*This database has been accessed >500,000 times since 10/02/97.*

Created by [John M. Butler](#)

# Forensic DNA Typing Textbooks Have Set the Standard for the Field

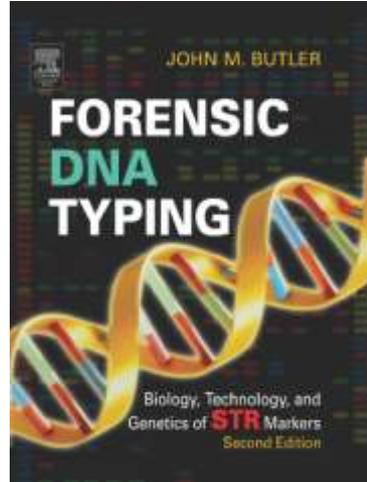
## 1<sup>st</sup> Edition



Jan 2001

335 pages

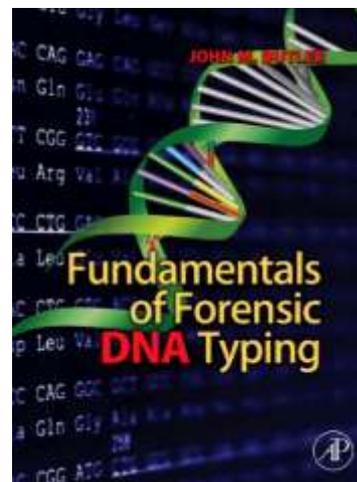
## 2<sup>nd</sup> Edition



Feb 2005

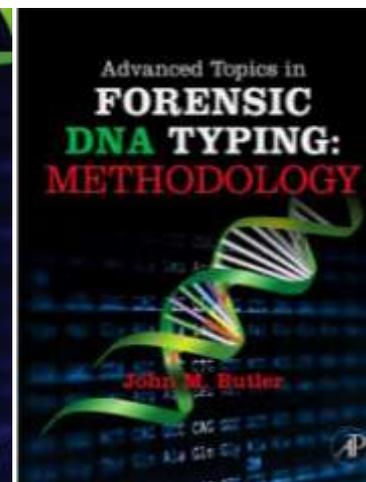
688 pages

## 3<sup>rd</sup> Edition (3 volumes)



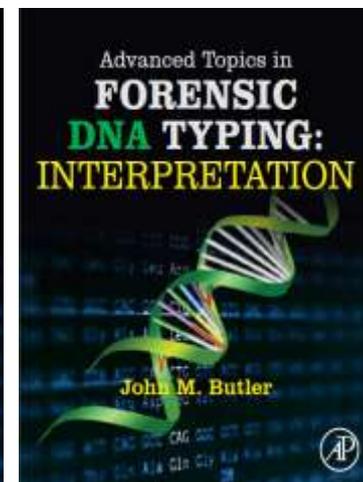
Sept 2009

520 pages



Aug 2011

704 pages

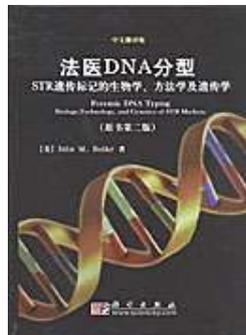


Oct 2014

608 pages

## Language Editions

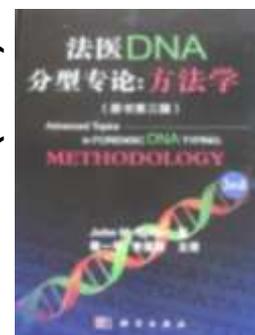
Chinese (2007)



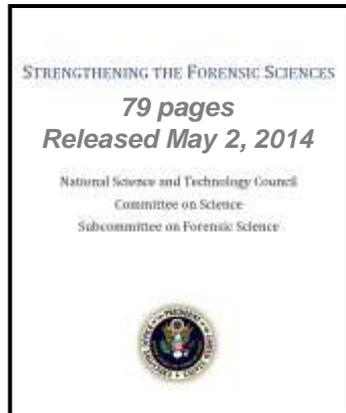
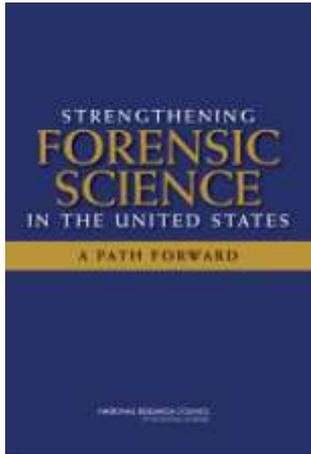
Japanese (2009)



Chinese (2013)



# NCFS and OSAC: U.S. Efforts to Strengthen Forensic Science



[http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/strengthening\\_the\\_forensic\\_sciences\\_may\\_-\\_2014.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/strengthening_the_forensic_sciences_may_-_2014.pdf)

- National Academy of Sciences (**NAS**) **report** issued in Feb 2009
- White House **Subcommittee on Forensic Science** (SoFS) operated from July 2009 to Dec 2012

## **DOJ/NIST Partnership** (announced Feb 2013)

1. **NCFS** (National Commission on Forensic Science)
  - First meeting held February 3-4, 2014 in Washington DC
2. **OSAC** (Organization of Scientific Area Committees)
  - 542 members named; first public meetings held in Feb 2015

# National Commission on Forensic Science

A Federal Advisory Committee  
for the U.S. Department of Justice



<http://www.justice.gov/ncfs>

# National Commission on Forensic Science (NCFS)

[www.justice.gov/ncfs](http://www.justice.gov/ncfs)

**Policy-focused**

**NCFS Leadership**

**31 voting and 8 *ex-officio* members**

**Last meeting (5<sup>th</sup>): January 29-30, 2015**

**Next meeting (6<sup>th</sup>): April 30-May 1, 2015**



**Sally Q. Yates**  
Acting  
Deputy Attorney General  
**DOJ Co-Chair**



**Willie E. May**  
Acting  
Director of NIST  
**NIST Co-Chair**



**Nelson A. Santos**  
Vice-Chair (DOJ)



**John M. Butler**  
Vice-Chair (NIST)

# February 3-4, 2014 was the first meeting of the **National Commission on Forensic Science**



*First meeting was  
not webcast but  
future ones will be*

37 Commissioners + DOJ/NIST Leadership Team (with ~100 public attendees)

# NCFS Membership: First Term (2013-2015)

- **31 voting and 8 ex-officio members**
  - Selected from >300 applicants
  - Represent diverse backgrounds, extensive experience, and come **from 21 states**
- Professors of biochemistry, chemistry, pathology, physics, sociology, statistics, and law (including a Nobel laureate and National Medal of Science recipient)
- Crime laboratory directors
- Judges, prosecutors, and defense attorneys
- Sheriff, detective, coroner, medical examiner, victims' advocate, and defendants' rights advocate

# Organization of Scientific Area Committees (OSAC)

Forensic discipline-specific “guidance groups” administered by NIST



**NIST**  
National Institute of  
Standards and Technology  
U.S. Department of Commerce

<http://www.nist.gov/forensics/osac/index.cfm>

# Listing of Scientific Working Groups (SWGs) as of 2013

	Scientific Working Group (SWG)	Topic (Forensic Discipline)	Start	Sponsor	Website
1	<b>SWG DAM</b>	<b>DNA</b>	1988	FBI	swgdam.org
2	SWG MAT	Materials (Trace)	1992	FBI	swgmat.org
3	SWG FAST	Friction Ridge (Fingerprints)	1995	FBI	swgfast.org
4	<b>SWG DRUG</b>	<b>Controlled Substances</b>	1997	DEA	swgdrug.org
5	SWG IT	Imaging Technologies	1997	FBI OTD	swgit.org
6	SWG DOC	Document Examination	1997	FBI	swgdoc.org
7	<b>SWG DE</b>	<b>Digital Evidence</b>	1998	FBI OTD	swgde.org
8	SWG GUN	Firearms & Toolmarks	1998	FBI	swggun.org
9	SWG FEX	Fire Debris & Explosives	1998	<b>NIJ</b>	swgfex.org
10	SWG STAIN	Bloodstain Pattern	2002	<b>NIJ</b>	swgstain.org
11	SWG TREAD	Shoeprint & Tire Tread	2004	FBI	swgtread.org
12	SWG DOG	Dog & Orthogonal Detector	2004	FBI	swgdog.fiu.edu
13	SWG GSR	Gun Shot Residue	2007	<b>NIJ</b>	swggsr.org
14	SWG ANTH	Anthropology	2008	FBI	swganth.org
15	SWG TOX	Toxicology	2009	<b>NIJ</b>	swgtox.org
16	FISWG	Facial Identification	2009	FBI OTD	fiswg.org
17	SWG DVI	Disaster Victim Identification	2010	FBI	swgdvi.org
18	SWG MDI	Medicolegal Death Investigation	2010	<b>NIJ/FBI</b>	swgmdi.org
19	SWG GEO	Geological Materials	2011	USACIL	swggeo.org
20	SWG WILD	Wildlife Forensics	2011	USFWS	wildlifeforensicscience.org/swgwild
21	SWG SPEAKER	Voice Analysis	2012	FBI	swg-speaker.org

# Organization of Scientific Area Committees (OSAC)

**Forensic Science Standards Board (FSSB)**

June 26

Legal Resource Committee (LRC)

July 16

Quality Infrastructure Committee (QIC)

Human Factors Committee (HFC)

collaborative group of 542 forensic practitioners & other experts

Sept 3

Biology/DNA SAC

Chemistry/  
Instrumental Analysis SAC

Crime Scene/  
Death Investigation SAC

Digital/Multimedia SAC

Physics/Pattern Interpretation SAC

Bottom portion (subcommittee membership) announced Oct 29 & Dec 22, 2014

Biological Data Interpretation and Reporting Sub

Fire Debris and Explosives Sub

Anthropology Sub

Digital Evidence Sub

Bloodstain Pattern Analysis Sub

Biological Methods Sub

Geological Materials Sub

Disaster Victim Identification Sub

Facial Identification Sub

Firearms and Toolmarks Sub

Wildlife Forensics Sub

Gunshot Residue Sub

Dogs and Sensors Sub

Speaker Recognition Sub

Footwear and Tire Sub

Materials (Trace) Sub

Fire and Explosion Investigation Sub

Video/Imaging Technology and Analysis Sub

Forensic Document Examination Sub

Seized Drugs Sub

Medicolegal Death Investigation Sub

Friction Ridge Sub

Toxicology Sub

Odontology Sub

SAC = Scientific Area Committee  
Sub = Subcommittee

>1200 additional applicants who can assist with task group efforts as OSAC affiliates

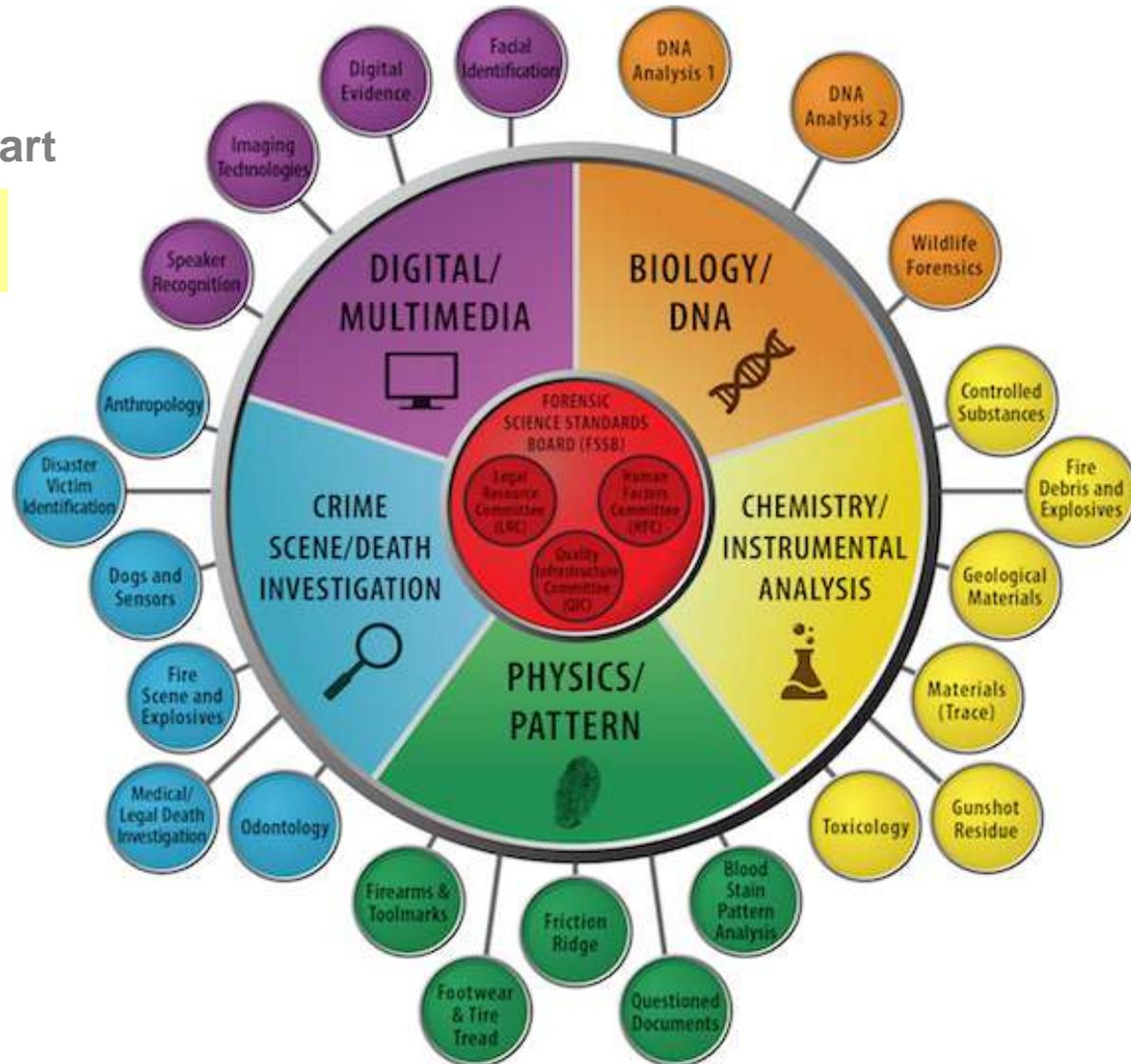
# Organization of Scientific Area Committees

## OSAC

Functional Organization Chart

***Practice-focused***

**542 members and >1200 affiliates** as subject matter experts participating in 24 subcommittees, 5 scientific areas, 3 resource committees (legal, quality, human factors), and 1 governing board (Forensic Science Standards Board)

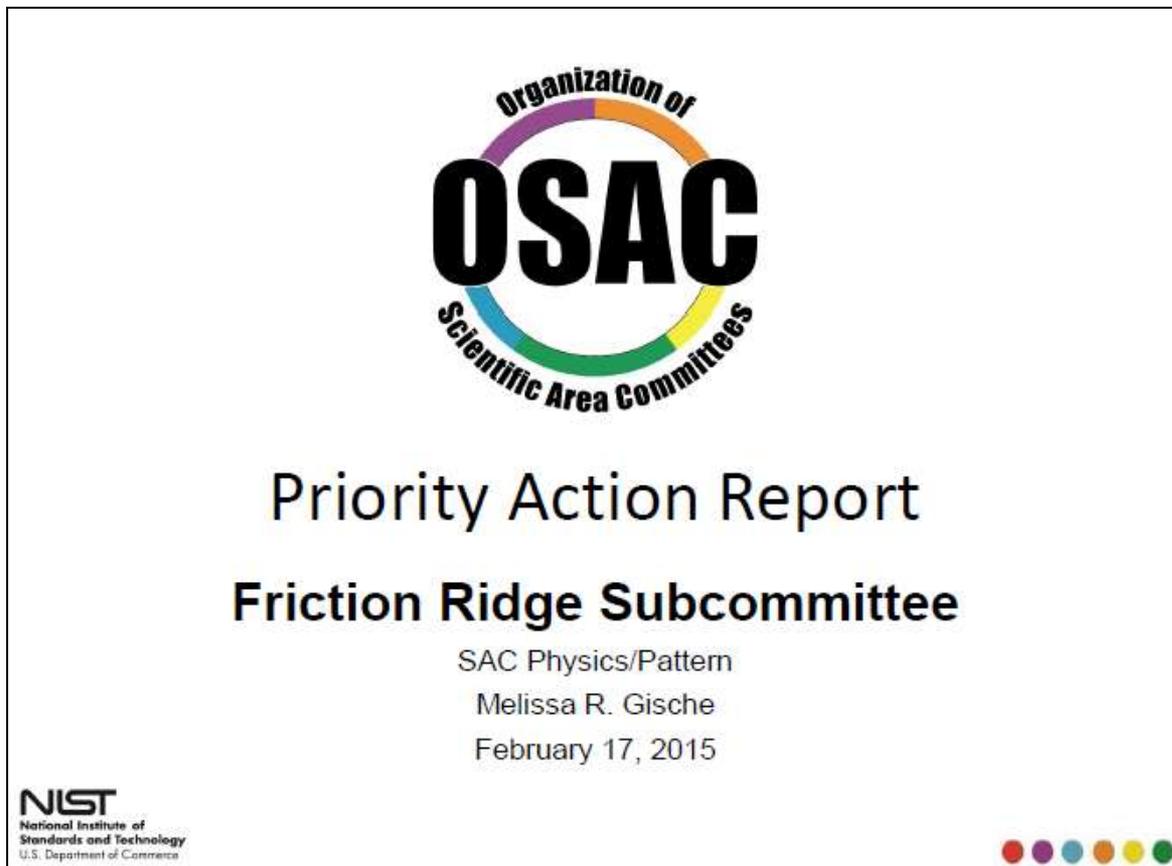


<http://www.nist.gov/forensics/osac/index.cfm>

Initial membership  
finalized Dec 22, 2014

# OSAC Scientific Area Committee Public Meetings held February 16-17, 2015 in Orlando, FL

**1 of 30 presentations that can be downloaded**



- This friction ridge subcommittee presentation contains 27 slides
- Reviews subcommittee leadership, membership, priority topics, and task groups

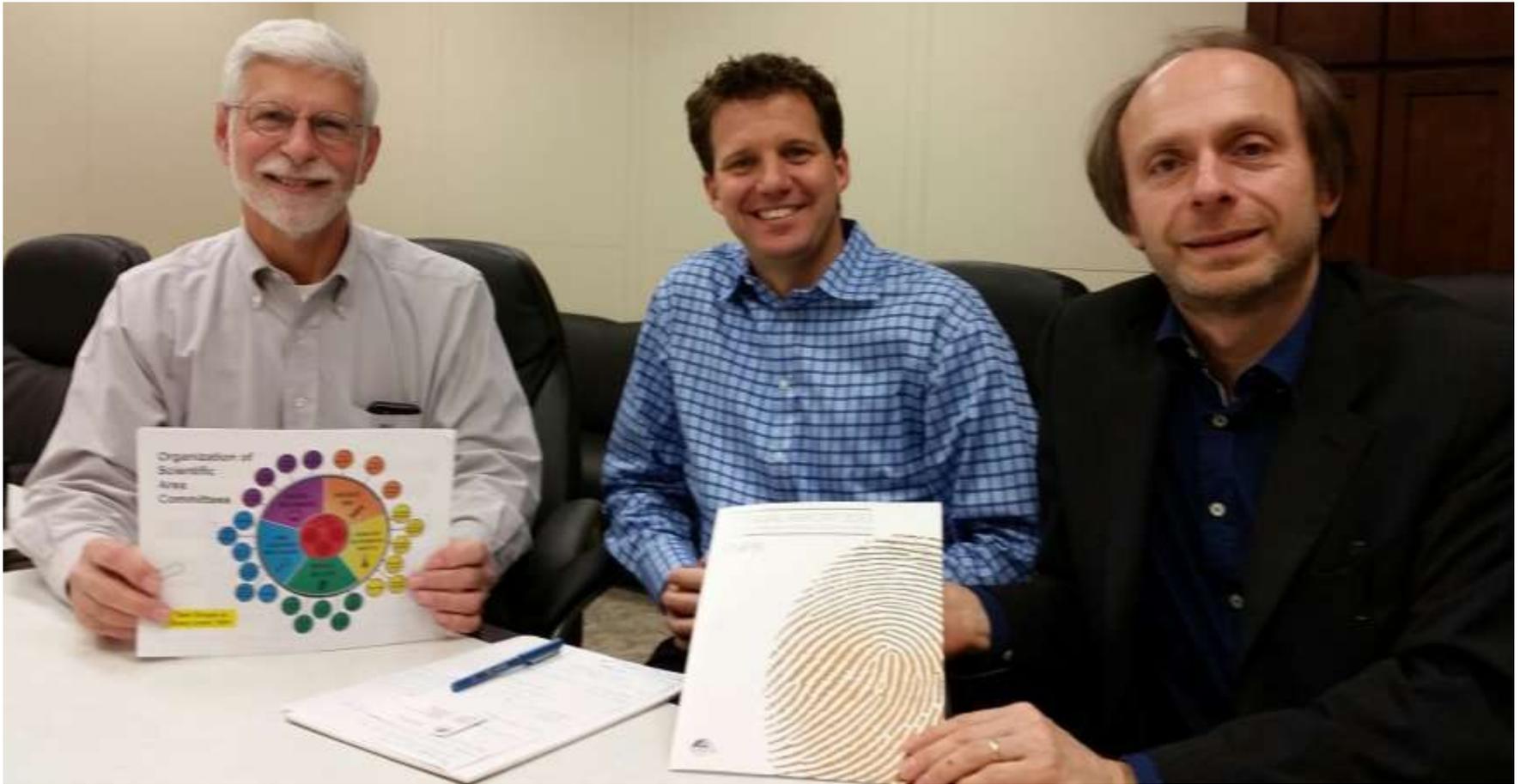
<https://workspace.forensicosac.org/kws/public>

# OSAC and ENFSI Connect

**Mark Stolorow (NIST)**  
Director of OSAC Affairs

**John Paul Jones (NIST)**  
Deputy Director of OSAC Affairs

**Jan de Kinder (Belgium)**  
ENFSI Chairman Designate



Dr. Jan de Kinder from the National Institute of Criminalistics and Criminology (Brussels, Belgium) visited NIST on March 18, 2015. He met with NIST OSAC leadership and discussed the Organization of Scientific Area Committees (OSAC) and how the European Network of Forensic Science Institutes (ENFSI) might interface with OSAC efforts. ENFSI has 64 member institutes, 2 standing committees, 17 working groups, and a 20 year history.



<http://www.nist.gov/forensics/osac/>

**Governing Board has 17 members**

**[Forensic Science Standards Board \(FSSB\)](#)**

**3 [Resource Committees](#)**

[Human Factors Committee](#) (HFC)

[Legal Resource Committee](#) (LRC)

[Quality Infrastructure Committee](#) (QIC)

**[Committees](#) (5) and [Subcommittees](#) (24)**

[Crime Scene/Death Investigation](#)

- [Anthropology](#)
- [Disaster Victim Identification](#)
- [Dogs and Sensors](#)
- [Fire Scene and Explosives](#)
- [Medical/Legal Death Investigation](#)
- [Odontology](#)

[Chemistry/Instrumental Analysis](#)

- [Controlled Substances](#)
- [Fire Debris and Explosives](#)
- [Geological Materials](#)
- [Gunshot Residue](#)
- [Materials \(Trace\)](#)
- [Toxicology](#)

[Digital/Multimedia](#)

- [Digital Evidence](#)
- [Facial Identification](#)
- [Imaging Technologies](#)
- [Speaker Recognition](#)

[Biology/DNA](#)

- [DNA Analysis 1](#)
- [DNA Analysis 2](#)
- [Wildlife Forensics](#)

[Physics/Pattern](#)

- [Bloodstain Pattern Analysis](#)
- [Friction Ridge](#)
- [Firearms/Toolmarks](#)
- [Footwear and Tire Tread](#)
- [Questioned Documents](#)



<http://www.enfsi.eu/>

**[Governing Board](#)** has 5 members

**2 Standing Committees**

[Quality & Competence Committee \(QCC\)](#)

[Research & Development Committee \(R&D\)](#)

**17 Expert Working Groups**

[Animal, Plant and Soil Traces](#)

[Digital Imaging](#)

[DNA](#)

[Documents](#)

[Drugs](#)

[Explosives](#)

[Fingerprint](#)

[Firearms/GSR](#)

[Fire and Explosions Investigation](#)

[Forensic Information Technology](#)

[Forensic Speech and Audio Analysis](#)

[Handwriting](#)

[Marks](#)

[Paint & Glass](#)

[Road Accident Analysis](#)

[Scene of Crime](#)

[Textile and Hair](#)

# International Symposium on Forensic Science Error Management – Detection, Measurement and Mitigation

FORENSIC SCIENCE  
ERROR MANAGEMENT

INTERNATIONAL  
FORENSICS SYMPOSIUM

JULY 20-24, 2015 • WASHINGTON, DC



The technical program will cover [eight tracks](#): *death investigation, crime scene investigation, human factors, criminalistics, digital evidence, legal factors, quality assurance and laboratory management*. Each track will consist of plenary lectures, poster sessions and panel discussions.

[Hilton Washington DC - Dupont Circle](#)

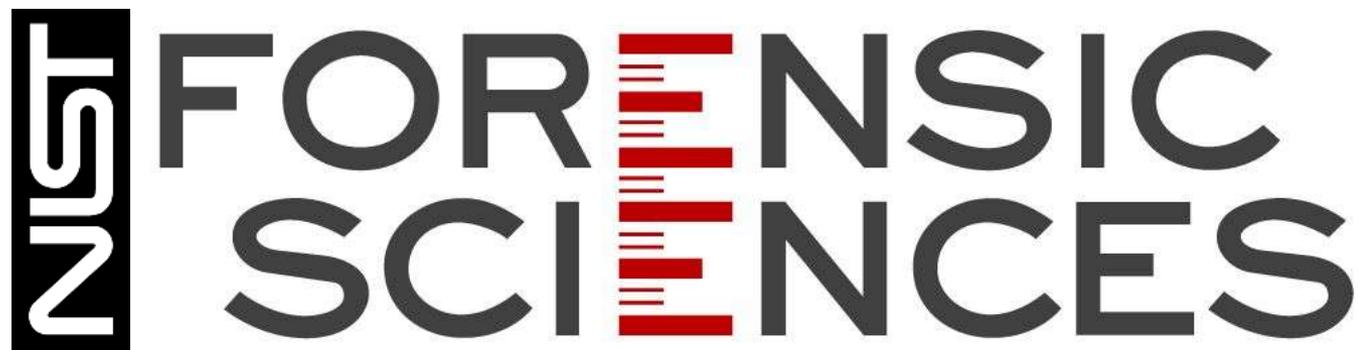
1919 Connecticut Ave., NW, Washington, DC

[http://www.nist.gov/director/international\\_forensics\\_home.cfm](http://www.nist.gov/director/international_forensics_home.cfm)

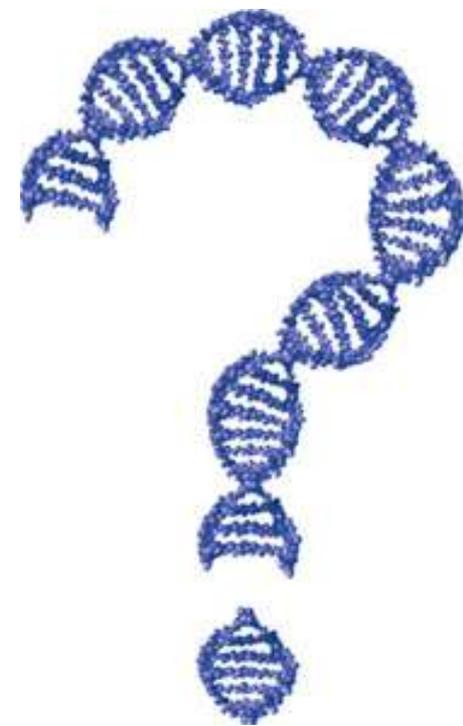
**Abstract deadline  
extended to April 30**

**National Commission on Forensic Science (NCFS):**  
[www.justice.gov/ncfs](http://www.justice.gov/ncfs)

**Organization of Scientific Area Committees (OSAC):**  
[www.nist.gov/forensics/osac/index.cfm](http://www.nist.gov/forensics/osac/index.cfm)



[www.nist.gov/forensics](http://www.nist.gov/forensics)



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john.butler@nist.gov